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PATENT APPLICATION

Attorney Docket No. 10951105-6

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Gary B. Gordon

Serial No.: 09/691,318 **Examiner:** R. Laneau

Filed: October 18, 2000 **Group Art Unit:** 2674

Title: METHOD AND SYSTEM FOR TRACKING ATTITUDE

Commissioner for Patents
Washington, D.C. 20231

ATTENTION: BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANT'S BRIEF
(37 CFR 1.192)

This Brief is in furtherance of the Notice of Appeal, filed in this case on February 1, 2002. The fees required under 37 CFR 1.17(f) are dealt with in the accompanying Transmittal of Appellant's Brief.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231.

Date of Deposit: March 25, 2002

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I. REAL PARTY OF INTEREST

The real party of interest in this Appeal is the party identified on the first page of this Brief. That is, the real party in interest is Agilent Technologies, Inc., as assignee of rights from the inventor.

II. RELATED APPEALS AND INTERFERENCES

There is no other appeal or interference that will directly affect, or be directly affected by, or have a bearing on the Boards' decision with regard to this Appeal.

III. STATUS OF CLAIMS

There are four pending claims in the application. Claims 17, 19, 20 and 22 are pending. Claims 17, 19, 20 and 22 have been rejected under 35 U.S.C. 103(a).

All of the pending claims are on appeal.

IV. STATUS OF AMENDMENTS

An Amendment after Final Office Rejection was filed on December 3, 2001. Claims 18 and 21 were cancelled. Amendments to claims 17, 19, 20 and 22 were proposed. The proposed changes were intended to overcome rejections under 35 U.S.C. 103(a).

In a subsequently mailed Advisory Action, it was asserted that the proposed amendments did not overcome the rejection, but that the proposed amendments would be entered upon the timely submission of a Notice of Appeal and Appeal Brief with the requisite fee. Therefore, the list of claims within the Appendix of this Appeal Brief incorporates the changes to the claims.

V. SUMMARY OF THE INVENTION

The invention relates to an arrangement of a lens system and photosensors in an array. The lens system (26 in Fig. 1) has a characteristic of introducing curvilinear distortion of an image when focusing the image onto the array of photosensors. On the other hand, the array is claimed as having a shape to achieve compensation for the curvilinear distortion introduced by the lens system.

Fig. 7 of the application as originally filed shows three positions of a T-shaped feature imaged with a distortion-free lens system onto a 32×32 pixel array (220). Because the lens system does not introduce curvilinear distortion, the shape of the T-shaped feature does not change with travel across the array. On the other hand, Fig. 8 illustrates the same feature imaged onto three positions of the pixel array using a simple lens system, so that curvilinear distortion is introduced. Fig. 9 shows in a stylized manner the way in which the feature will then be interpreted by the processing circuitry. As is explained on page 24, lines 3–32 of the application as originally filed, the T-shaped feature will be viewed differently as it changes position within the array. This reduces the quality of the image process.

While Figs. 8 and 9 illustrate the prior art, Fig. 10 illustrates a two-dimensional array (226) of photosensors configured in the manner described in the pending claims. That is, the two-dimensional array of photosensors is configured to achieve compensation for the curvilinear distortion introduced by the lens system. Again, a T-shaped feature is shown in three different positions. It can be noted that although the three images of the feature are still distorted, the distortion causes the images to fit within the pixels. Thus, each image of the T-shaped feature will be viewed as being rectangular by the image processing circuitry (see Fig. 11).

In the array (226) of photosensors of Fig. 10, the optical axis is at the center of the array and vertical boundaries that space apart adjacent photosensor columns at or near the optical axis are relatively straight, as compared to the vertical

boundaries between columns that are at or near the left and right edges of the array. That is, the curvatures of the arcuate vertical boundaries between columns in Fig. 10 increase with departure from the optical axis. The embodiment of Fig. 10 also fits within the description of dependent claims 19 and 22, since adjacent rows of photo-sensors in the array are spaced apart by arcuate horizontal boundaries, with curvature of the horizontal boundaries increasing with departure from the optical axis of the array.

VI. ISSUES

The following issue is presented for review: Whether claims 17, 19, 20 and 22 are patentable under 35 U.S.C. 103(a) over U.S. Pat. No. 6,003,773 to Durbin et al.

VII. GROUPING OF CLAIMS

The claims do not stand and fall together, since independent claims 17 and 20 describe a photosensor array having one dimension of boundary curvature (column-to-column), while dependent claims 19 and 22 add description of a second dimension of boundary curvature (row-to-row), Appellant respectfully requests reconsideration of the independent claims as one group and the dependent claims as a second group.

VIII. ARGUMENTS

In an Office action mailed October 2, 2001, it was correctly pointed out that Appellant contends that the standard which must be applied in the obviousness determination under Section 103(a) is that there must be some suggestion or

motivation, either in the cited references or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. In re Fine, 5 USPQ2d 1596 (Fed. Cir. 1988). However, as a response to Appellant's statement of the standard, the Office action (1) implied that Appellant argued that it is necessary for a reference to expressly suggest changes or improvements and (2) stated that the test for combining references is what the references as a whole would have suggested to one of ordinary skill in the art. Appellant agrees that suggestions regarding changes or improvements do not need to be expressly stated, but points out that the "test" set forth in the Office action regarding combining references is irrelevant with regard to determining the patentability of the pending claims. The rejection of claims 17, 19, 20 and 22 is based solely upon the Durbin et al. patent. Thus, a *prima facie* case of obviousness of the pending claims is established only if there is a suggestion or motivation to modify the Durbin et al. teachings, where the suggestion or motivation is found either in the Durbin et al. patent or in the knowledge generally available to one of ordinary skill in the art.

In applying the teachings of Durbin et al. to the pending claims, the October 2, 2001 Office action relied upon the accuracy of different conclusions that certain features of Durbin et al. are inherent. Firstly, it is stated that the Durbin et al. patent does not specifically disclose that the shape of the photosensor array would achieve compensation, "but this is an inherent feature for photosensor arrays having a lens system." If this statement is that the lens system provides the compensation, Durbin et al. teaches away from the claimed invention, since independent claims 17 and 20 describe the lens system as having a characteristic of introducing curvilinear distortion of an image. On the other hand, if the Office action is stating that photosensor arrays inherently achieve compensation of the curvilinear distortion introduced by the lens system, Appellant respectfully, but assertively, contends that this is contrary to "the knowledge generally available to one of ordinary skill in the art." Therefore, a *prima facie* case of obviousness is not established. Secondly, the Office

action cites Fig. 1 of Durbin et al. for an array of photosensors disposed in columns and rows and alleges that "having the columns spaced apart by an arcuate boundary with radii increasing with departure of curvature is an inherent feature." Fig. 1 of Durbin et al. illustrates a rectangular array of rectangular photosensors. Appellant asserts that it is not inherent to include arcuate boundaries between adjacent columns of photosensors. In fact, the arcuate boundaries described in the pending claims directly contradict the description of the array that is illustrated in Fig. 1 of Durbin et al. Thus, for a second reason, the *prima facie* case of obviousness has not been presented. These two reasons as to why the pending claims are patentable over the Durbin et al. patent will be addressed in greater detail in sections that follow. Moreover, additional reasons for determining that the pending claims are patentable over the prior art will be identified.

A. Shaping the Photosensor Array to Achieve Compensation of Curvilinear Distortion

Independent claims 17 and 20 describe the array as having a shape to achieve compensation of curvilinear distortion introduced by the lens system. The validity of the rejection of the claims is dependent upon the accuracy of the conclusion set forth in the Office action that achieving compensation is an inherent feature of photosensor arrays having a lens system. More specifically, it is the photosensor array itself that must inherently achieve compensation, if it is to be held that Durbin et al. presents a *prima facie* case of obviousness. However, in Fig. 8 of Appellant's application as originally filed, the same T-shaped feature is shown at three locations within a single photosensor array (222). Fig. 9 of Appellant's application represents how the feature will be "viewed" at the three positions. This rectangular photosensor array having square photosensing elements does not inherently achieve compensation of the curvilinear distortion shown in Fig. 8. Instead, two of the three T-shaped features are shown as being mis-shaped as a consequence of curvilinear distortion.

The phenomenon is well known in the optical and photosensor art. Photosensor arrays do not inherently provide compensation for the phenomenon.

Fig. 1 of Durbin et al. is cited in the Office action. This figure includes rectangular photosensor elements, similar to Figs. 8 and 9 of the pending application. Thus, the operations will be similar. The shape of the array described in Durbin et al. does not inherently provide compensation for curvilinear distortion. Consequently, Appellant respectfully asserts that the logic identified as grounds for rejecting the pending claims under Section 103(a) is not based on fact, if it is interpreted as a statement that photosensor arrays inherently achieve compensation for curvilinear distortion introduced by a lens system.

A second possible interpretation of the inherency assertion is that the compensation for curvilinear distortion is provided by the lens system, since the rejection of the claims states that it is an "inherent feature for photosensor arrays having a lens system" to achieve compensation. However, in a proper Section 103(a) determination, claims must be considered as a whole. Stratoflex, Inc. v Aeroquip Corp., 218 USPQ 871 (Fed. Cir. 1983). Both independent claim 17 and independent claim 20 state that the lens system of the present invention has a characteristic of introducing the curvilinear distortion of the image directed to the photosensor array. Consequently, if the lens system of the prior art or the lens system to be applied to the Durbin et al. photosensor array provides compensation for curvilinear distortion, the prior art teaches directly away from the claimed invention. Courts are unanimous in holding that references that lead away from the claims at issue are evidence of the patentability of the claims. W.L. Gore & Associates, Inc. v Garlock, Inc., 220 USPQ 303 (Fed. Cir. 1983). Thus, if the Office action statement regarding the inherency of achieving compensation is referring to use of the lens system to provide the compensation, this interpretation is inconsistent with the claims as a whole, so that a *prima facie* case of obviousness has not been presented.

As a third possible approach to interpreting the statement that it is an inherent feature for photosensor arrays having a lens system to achieve compensation, the term "compensation" can be interpreted broadly to include compensation for different types of distortion. The Durbin et al. patent does describe a number of techniques for achieving distortion compensation. However, none of the techniques includes providing an array having arcuate edges or providing arcuate boundaries between adjacent columns and/or adjacent rows of photosensors. In column 18 of the patent, it is stated that compensation may occur at the optics, the reader, or the electronic processing. The optical correction occurs if the magnification of the optics is tailored in one of three identified manners. However, tailoring the optics to provide compensation is inconsistent with the invention described in the pending claims, since independent claims 17 and 20 describe the lens system as having a characteristic of introducing curvilinear distortion, rather than correcting distortion. As an alternative in achieving compensation, column 18 of Durbin et al. states that the reader (12) may be increased in resolution (number of pixels per row and column) to modify the apparent height-to-width ratio of the generated image so as to more closely correspond to the height-to-width ratio of the labels being read. However, this increase in resolution of the sensor does not teach or suggest the claimed invention, since the shape of the photosensor array is not varied and the columns are not spaced apart by arcuate boundaries.

As another alternative to providing compensation in accordance with Durbin et al., column 18 states that the sensor may be oriented obliquely, such that the plane of the sensor substantially coincides with the plane of the image (20) that is generated. In this manner, the distortion that is caused by oblique scanning can be automatically corrected. This orientation does not teach or suggest the claimed invention. Appellant does not broadly claim to have invented compensation for distortion. Rather, Appellant's claims are directed to the invention described with reference to Fig. 10 of the specification as originally filed. By teaching that the

photosensor array is rectangular in shape, the prior art reference teaches away from the claimed invention. Therefore, Durbin et al. does not present a *prima facie* case of obviousness.

In conclusion, Figs. 8 and 9 in Appellant's application as originally filed illustrate curvilinear distortion introduced by a lens system in imaging a T-shaped feature onto three positions of a photosensor array and illustrate that the photosensor array does not inherently compensate for the curvilinear distortion introduced by the lens system. Appellant asserts that the Section 103(a) rejection of the pending claims is flawed, since it is inaccurate to state that a photosensor array having a lens system inherently achieves compensation for curvilinear distortion. It follows that the pending claims are in an allowable condition.

B. The Teachings of Durbin et al. Regarding Arcuate Boundaries

In addressing the claimed features regarding arcuate boundaries, the October 2, 2001, Office action asserts that as per these claims, (1) Durbin et al. teaches photosensors that are disposed in columns and rows, citing Fig. 1 of Durbin et al., and (2) alleges that "having the columns spaced apart by an arcuate boundary with radii increasing with departure of curvature is also an inherent feature." Appellant respectfully disagrees.

The Durbin et al. patent teachings with regard to the cited Fig. 1 are consistent with the arrays shown in Figs. 8 and 9 of Appellant's pending application as originally filed. Fig. 1 of Durbin et al. is illustrated and described as being comprised of an array of pixels in which the resolution per individual pixel is 0.004 inch by 0.005 inch (column 9, lines 22–25 of the patent). There are 492 pixels in the vertical direction and 512 pixels in the horizontal direction. Thus, the combined resolution in the horizontal direction is 2.560 inches (0.005 × 512) and the combined resolution in the vertical direction is 1.968 inches (0.004 × 492). This is very close to the dimensions

taught in Fig. 1, which are 2.580 inches by 1.940 inches. Clearly, the rectangular pixels are in a side-by-side arrangement. More importantly, the columns of rectangular photosensors are not spaced apart by arcuate boundaries, since the stated dimensions of the array would not tolerate arcuate boundaries between adjacent columns (Appellant's independent claims) or arcuate boundaries between adjacent rows (Appellant's dependent claims). Consequently, it is inaccurate to state that having columns of photosensors spaced apart by an arcuate boundary is inherent and it is inaccurate to state that the Durbin et al. patent presents a *prima facie* case of obviousness with regard to the pending claims.

Fig. 8 of Appellant's application illustrates a photosensor array having columns and rows of photosensors. In comparison to Fig. 1 of Durbin et al., the individual photosensors of Fig. 8 are square, rather than rectangular. However, in both cases, the boundaries between adjacent columns and the boundaries between adjacent rows are linear, rather than being arcuate. Moreover, as in Durbin et al., no boundary increases in curvature. Again, having columns of photosensors spaced apart by arcuate boundaries is not an inherent feature. Appellant asserts that the Office action does not present a *prima facie* case of obviousness with regard to the pending claims.

C. The Teachings of Durbin et al. Regarding Structural Variations "With Departure of Curvature"

In addressing the patentability of the invention, the Office action of October 2, 2001, mischaracterizes the invention. The mischaracterization is carried forward from the previous Office action of April 25, 2001. In both Office actions, the obviousness of the claimed structure was examined with respect to "departure of curvature." None of the pending claims describes structure with respect to departure of curvature. Rather, the structure is described with reference to "departure from said

optical axis" of the photosensor array. The analysis of the structure of a column-to-column boundary or a row-to-row boundary "with departure of curvature" is significantly different than the description of the structure of the column and row boundaries with respect to "departure from the optical axis of the array."

Appellant respectfully asserts that when the Section 103(a) determination is applied to an accurate interpretation of the claim language, the claims are in an allowable condition.

D. The Teachings of Durbin et al. Regarding the Shape of the Photosensor Array

The paragraph that is found in column 15, lines 4–13 of Durbin et al. was cited for its teachings regarding the shape of the photosensor array. This paragraph states that while the current state of the art of photosensor arrays is to provide a rectangular shape, other shapes may be substituted. In response, Appellant points out that changing the shape of the photosensor array would not render the pending claims obvious under Section 103(a), since the pending claims describe arcuate boundaries between adjacent columns (independent claims 17 and 20) and between adjacent rows (dependent claims 19 and 22). Even if one were to modify the photo-sensor array of Durbin et al. to have a shape other than a rectangular, it would not be an inherent feature to have arcuate boundaries between adjacent columns.

As is well known in the art, it is conventional to form straight lines during integrated circuit fabrication. Adding curvature to features formed using conventional wafer fabrication techniques significantly adds to the cost of the fabrication process. Modifying the rectangular array of Durbin et al. could be carried out simply and economically by forming the array as taught by Fig. 1 of the patent and then removing portions of the array to provide the desired non-rectangular shape. This would be the conventional approach. Arcuate boundaries between adjacent columns of photo-sensors are not inherent to photosensor arrays having arcuate outer edges. Again,

Appellant asserts that a *prima facie* case of obviousness has not been presented by the citation of the Durbin et al. patent.

The alleged motivations for modifying the teachings of Durbin et al. are that there would be "automatic control of the lens system" and that there would be a better displayed image when looking at a distance. However, nothing within the Durbin et al. patent teaches or suggests that automatic control of the lens system may be achieved by shaping the photosensor array. Rather, the cited paragraph in column 15 of Durbin et al. merely states that the shape of the lens is based on the shape of the photosensor array. Nothing within the rejection of the pending claims provides explanation as to how the structure of the photosensor array achieves "automatic control" of the lens system. Appellant's claimed invention does not provide automatic control of the lens system. In fact, the structure of the claimed photosensor array relaxes the requirements of the lens system, since the lens system can have a characteristic of introducing curvilinear distortion of the image focused onto the array.

E. Conclusion

Appellant respectfully asserts that it is inaccurate to state that a photosensor having columns and rows of photosensors inherently includes arcuate boundaries between adjacent columns, with the curvatures of the arcuate boundaries increasing with departure from the optical axis of the photosensor array. In fact, Figs. 8 and 9 of Appellant's application, as well as the description regarding Fig. 1 of the cited patent to Durbin et al., show photosensor arrays that do not include this feature.

Appellant respectfully points out that the rejection of the claims mischaracterizes the claimed invention, since it refers to the inherency, or obviousness, of structural features based upon "departure of curvature." On the other hand, the pending claims describe structural features on the basis of "departure from said

optical axis" of the photosensor array. Specifically, curvatures of the arcuate boundaries increase with departure from the optical axis, as set forth in the pending claims. When the language of the claims is properly interpreted, the pending claims are patentable over the teachings of Durbin et al.

The pending claims state that the lens system has a characteristic of introducing curvilinear distortion of an image focused on the photosensor array and that the array is structured to achieve compensation of the curvilinear distortion. The Office action agrees that the Durbin et al. patent does not specifically disclose that the shape of the array achieves compensation, but asserts that "this is an inherent feature for photosensor arrays having a lens system." Unfortunately, the rejection does not explain this assertion regarding inherent features. Figs. 8 and 9 of Appellant's application as originally filed show that the shape of a photosensor array does not inherently achieve compensation for curvilinear distortion.

It is respectfully submitted that the citation of the Durbin et al. patent does not present a *prima facie* case of obviousness of the pending claims, when the claims are properly interpreted.

IX. RELIEF SOUGHT

Appellant respectfully requests reversal of the rejection under 35 U.S.C. 103(a). An indication of patentability of the claimed invention is sought.

Respectfully submitted,
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APPENDIX

CLAIMS INVOLVED IN THE APPEAL

17. (amended) An arrangement of a sensor and optics comprising:

an array of photosensors; and

a lens system for providing a focus for imaging by said array, said lens system having a characteristic of introducing curvilinear distortion of an image to said array;

said array having a shape to achieve compensation of said curvilinear distortion, including having arcuate edges to establish said compensation;

wherein said photosensors are disposed in a plurality of columns and a plurality of rows and wherein said photosensors combine to define an optical axis for said array, adjacent columns being spaced apart by an arcuate boundary, with curvatures of said arcuate boundaries increasing with departure from said optical axis.

19. (amended) The arrangement of claim 17 wherein adjacent rows are spaced apart by second arcuate boundaries, with curvature of said second arcuate boundaries increasing with departure from said optical axis.

20. (amended) An arrangement of a sensor and optics comprising:

a two-dimensional array of photosensors; and

a lens system for providing a focus for imaging by said array, said lens system having a characteristic of optically introducing curvilinear distortion of an image to said array;

said array having a curvilinear shape to achieve compensation of said curvilinear distortion, including having a plurality of arcuate outer edges to establish said compensation, said photosensors being varied dimensionally to define said curvilinear shape, said curvilinear shape being aligned relative to said curvilinear distortion to introduce a physical distortion that offsets said optically introduced curvilinear distortion;

wherein said photosensors are disposed in a plurality of columns and a plurality of rows and wherein said photosensors combine to define an optical axis for said array, adjacent columns being spaced apart by an arcuate boundary, with curvatures of said arcuate boundaries increasing with departure from said optical axis.

22. (amended) The arrangement of claim 20 wherein adjacent rows are spaced apart by second arcuate boundaries, with curvature of said second arcuate boundaries increasing with departure from said optical axis.